



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> :

A61C 8/00

A1

(11) International Publication Number:

WO 00/54696

(43) International Publication Date: 21 September 2000 (21.09.00)

(21) International Application Number: PCT/EP00/00630

(22) International Filing Date: 27 January 2000 (27.01.00)

(30) Priority Data:

UD99A000056

16 March 1999 (16.03.99)

IT

(71)(72) Applicant and Inventor: GALLICCHIO, Antonio [IT/IT];  
Via Giuseppe Lacchin, 32, I-33077 Sacile (IT).

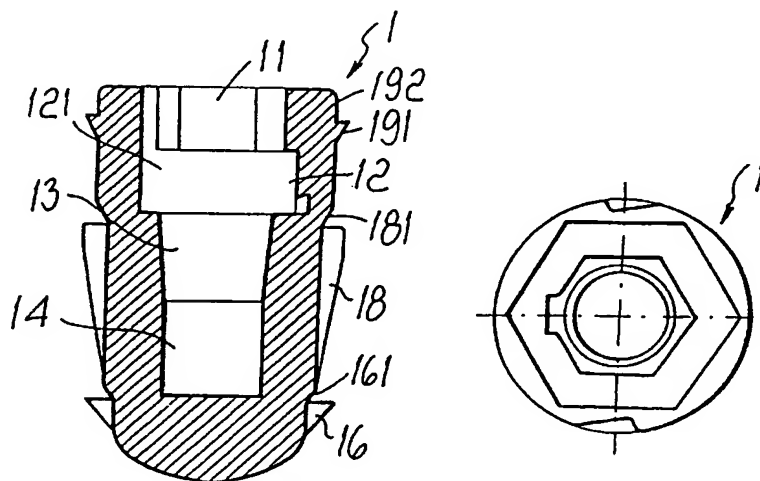
(74) Agent: MODIANO, Guido; Modiano &amp; Associati, Via Meravigli, 16, I-20123 Milano (IT).

(81) Designated States: AU, BR, CA, JP, MX, US, European patent  
(AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT,  
LU, MC, NL, PT, SE).

Published

With international search report.

(54) Title: IMPLANT FOR ARTIFICIAL TEETH



## (57) Abstract

An implant for artificial teeth, comprising: an intrabony insert or implant (1) which is designed to be inserted in a fixed manner in the jawbone and is provided with a cavity (10); an artificial tooth assembly with a tooth stump (3) for the respective artificial tooth and a stem to be inserted and fixed in said cavity of said intrabony insert or implant; said cavity (10) of said intrabony implant has an undercut annular recess (12) below and above which there are hole portions (11, 13, 14) having a smaller diameter, one (11) of said hole portions, above said recess (12), being interrupted by at least one longitudinal access slot (121) for the passage of at least one lug of the stem of said tooth stump (3) by axial sliding and subsequent rotation, the outer upper end of said intrabony implant being polygonal, said tooth stump (3) protruding beyond said lug with a polygonal region for the insertion of a polygonal annular bush for the mutual locking of said stump (3) with respect to said intrabony implant (1) so as to prevent rotation.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

## IMPLANT FOR ARTIFICIAL TEETH

### Technical Field

The present invention relates to an implant for artificial teeth.

### Background Art

5       The invention is used particularly but not exclusively in the field of prosthodontics, where artificial teeth are fitted in the human jaw by inserting a metallic implant for each tooth in the jawbone and by fixing a corresponding artificial tooth therein.

Prostheses for artificial teeth are already known which use:

10       -- at least one artificial tooth support, which is designed to replace the root of the removed tooth and can be stably inserted in the jawbone at the region where the artificial tooth is to be applied, said support being generally made of titanium and being hollow (this support is commonly known as intrabony implant);

15       -- at least one structure for supporting an interchangeable artificial tooth with a tang for engagement in the recess of the tooth support (commonly known as stump).

The stump and the intrabony implant are coupled by fixing means which, in the current art, are mainly constituted by axial screw means whose  
20       drawback is that they are complicated and expensive as well as difficult to apply.

Furthermore, the screw coupling easily loosens due to the stresses produced by chewing and this can even lead to breakage of the threads, with possibly severe damage.

25       A solution to this problem, proposed by the same Applicant, is disclosed in Italian patent application UD 97 A 00084, which provides for an implantation system for artificial teeth of the type which provides for a hollow intrabony insert or implant to be inserted in a fixed manner in the jawbone and an artificial tooth assembly which has a stump associated with  
30       means for fixing in said insert.

According to this solution, in the cavity of the intrabony implant there are at least two annular ridges which are spaced and whose annular shape is interrupted so that the interruption is formed in one ridge in opposition to the interruption of the other ridge.

5 The stump also has a protrusion which enters and engages the cavity and has two lugs at the interruptions in order to pass beyond the ridges by axial insertion coupling and, by rotation, into corresponding underlying annular slots, engaging below them so as to prevent extraction.

In this manner, the problems are partially solved; in particular, greater  
10 safety against the danger of losing the artificial tooth is achieved.

Even this solution, however, is complicated and particularly expensive due to the provision of the double annular undercut acting as safety coupling with rotary insertion coupling, which is necessary in any case to avoid the danger of disengagement.

15 Such complexity is further increased by the limited size of the implants, also in view of the fact that the presence of the double undercut reduces the resisting cross-section, with the danger of failure.

Therefore, although the above solution is theoretically valid, it still entails a structure which is complicated and therefore, despite the higher  
20 safety that it provides, is expensive and therefore applicable only to users who can afford this higher cost.

Another drawback that occurs in conventional solutions is due to the fact that the annular thickness of the intrabony implant (outside diameter with respect to the cavity diameter) is necessarily reduced, since the outside  
25 diameter is limited by the thickness of the jawbone in the implantation area, and therefore there is the risk of excessively weakening the tang of the stump or the wall of the intrabony implant that accommodates the tang.

In any case, in view of the extremely intense stresses applied by the jaw during chewing, there is the danger that the former or the latter may break.

### Disclosure of the Invention

The aim of the present invention is, therefore, to eliminate the drawbacks noted above in conventional types, providing a new implant for artificial teeth in which the fixing means are even quicker and simpler than current ones yet are reliable and have low production costs.

This aim and other objects which will become apparent hereinafter are achieved by an implant for artificial teeth, comprising:

-- an intrabony insert or implant which is designed to be inserted in a fixed manner in the jawbone and is provided with a cavity;

-- an artificial tooth assembly with a tooth stump for the respective artificial tooth and a stem to be inserted and fixed in said cavity of said intrabony insert or implant;

characterized in that said cavity of said intrabony implant has an undercut annular recess below and above which there are hole portions having a smaller diameter, one of said hole portions, above said recess, being interrupted by at least one longitudinal access slot for the passage of at least one lug of the stem of said tooth stump by axial sliding and subsequent rotation, the outer upper end of said intrabony implant being polygonal, said tooth stump protruding beyond said lug with a polygonal region for the insertion of a polygonal annular bush for the mutual locking of said stump with respect to said intrabony implant so as to prevent rotation.

### Brief Description of the Drawings

Further characteristics and advantages of the invention will become apparent from the detailed description of some embodiments, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional view of the intrabony metallic insert (generally made of titanium) according to the invention with a stump associated therewith;

Figure 2 is a plan view of the intrabony implant of Figure 1;

Figure 3 is a partially sectional view of the intrabony implant of Figure 1, taken from the outside;

Figure 4 is a perspective view of the implant according to the invention  
5 with a rotation-preventing bush;

Figures 5 and 6 are, respectively, a sectional front view and a top view of an extension ring made of calcinable resin which can be fitted over the prosthodontic implant;

Figures 7 and 8 are a front view and a top view of a titanium stump;

10 Figures 9 and 10 are an axial sectional front view and a top view of a titanium implant;

Figure 11 is a sectional view of the assembly of the components of the implant in the assembled condition;

Figures 12 and 13 are, respectively, a top view and a longitudinal  
15 sectional view of an intrabony implant in another embodiment of the invention;

Figures 14, 15 and 16 are, respectively, a top view, a sectional view and a side view of an annular rotation-preventing bush;

Figure 17 is a side view of a stump;

20 Figure 18 is a sectional view of the components in the assembled condition.

#### Ways of carrying out the Invention

With reference to the above Figures 1 to 11, in a first embodiment the implant according to the invention comprises a hollow intrabony implant or  
25 insert 1 to be inserted in a fixed manner in the jawbone, not shown in the figures, and an artificial tooth assembly which has a stump 3 for the respective artificial tooth, also not shown, with a protrusion 9 for insertion coupling with said artificial tooth and a lower stem 32 for entering a cavity 10 of the intrabony implant or insert 1 for fixing it.

30 The cavity 10 of the intrabony implant 1 is composed, sequentially from

the top downwards, of portions 11, 12, 13 and 14 which will be better described hereinafter.

The cavity 10 is in fact provided with an undercut annular recess 12 and with at least one longitudinal slot 121 which cooperates with at least one lug 131 of the stump 3 in order to provide coupling by axial insertion and subsequent rotation, associated with a beveled locking coupling and with an external polygonal shape of both, in order to fit a rotation-preventing keying ring 2.

In particular, in the cavity 10 of the intrabony implant 1, below the undercut annular recess 12 there are two hole portions having a smaller diameter, respectively a conical portion 13 followed by a cylindrical one 14; above said recess there is a hole portion having a smaller diameter 11 which is interrupted by the longitudinal access slot 121 for the passage of the lug 131 of the stem 32 of said tooth stump 3.

The outer upper end 192 of the intrabony implant 1 is polygonal.

The tooth stump 3 protrudes beyond lug 131 with two portions 34 and 35 which correspond to the portions 13 and 14 of the cavity 10 with which they mate.

The stump 3 is externally provided, above the lug 131, in the part 9 that protrudes beyond the intrabony implant 1, when it is inserted, with a polygonal region 193.

The outer shaped regions 192 and 193, of the implant 1 and of the stump 3 respectively, are adapted for the coupling of a rotation-preventing locking bush 2 which is shaped internally like a polygonal ring and is suitable to fit around both regions in order to be locked thereat and prevent the mutual rotation of the two parts.

Advantageously, the intrabony outer part of the implant 1 is sanded and consists of two threaded portions 16 and 18 with two different types of thread in order to facilitate insertion and grip.

Both threaded portions 16 and 18 end, in an upward region, with

respective shoulders 161 and 181, each of which is substantially formed by a fishbone wedge so as to improve grip.

Equally advantageously, in the threaded regions there are longitudinal notches 162 and 182 so as to provide correspond cutting edges for the self-tapping of the implant 1 on the bone during screwing.

It should also be noted that the mating between the portions 13 of the implant 1 and 34 of the stump 3, which are beveled, gives greater safety and solidity to the mating.

With reference now to the above cited Figures 12 to 18, in another embodiment the implant according to the invention comprises a hollow intrabony implant or insert 201, to be inserted in a fixed manner in the jawbone, not shown in the figures, and an artificial tooth assembly, which has a stump 203 for the respective artificial tooth, also not shown, with a protrusion 209 for engagement with the artificial tooth and a lower portion 232 for entering the cavity 210 of the intrabony insert or implant 201 in order to fix it.

The cavity 210 of the intrabony implant 201 is composed, from the top downwards, of portions 211, 212 and 214 described in detail hereinafter.

The cavity 210 has an undercut annular recess 212 and three longitudinal slots 221 (arranged at  $120^\circ$  to each other), which cooperate with at least one lug 331 of the stump 203, in order to provide coupling by axial insertion and subsequent rotation, associated with a mating by virtue of the external polygonal shape of both parts in order to fit a rotation-preventing keying ring 202.

The cavity 210 of the intrabony implant 201 has an undercut annular recess 212 below which there is a portion 214 of a cylindrical hole which has a smaller diameter and above which there is a hole portion having a smaller diameter 211 which is interrupted by the longitudinal access slot 221 for the passage of a lug 331 of the stem 232 of the tooth stump 203 by axial sliding and subsequent rotation.



The lower part 234 of the stump 203 to be inserted in the cavity 210 has an end part 235 which has a smaller diameter and is covered by a cap-shaped element 236 made of elastic material (for example Teflon).

The distance between the upper part of the recess 212 and the bottom of the cavity 210 is slightly shorter than the distance between the upper part of the lug 331 and the end of the element 236, so that the latter is slightly compressed upon mating.

Once mating has been provided, the lug 331 is pushed against the upper part of the recess 212 so as to provide rotation-preventing friction.

The outer upper end 392 of the intrabony implant 201 is polygonal.

The tooth stump 203 protrudes beyond the lug 331 with the part 234 that corresponds to the portion 214 of the cavity 210 with which it mates by virtue of the interposition of the element 236.

The stump 203 is externally provided, above lug 331, in the part 209 that protrudes beyond the intrabony implant 201, when inserted, with a polygonal region 393.

The outer shaped regions 392 and 393 of the implant 201 and of the stump 203, respectively, are adapted for the coupling of a rotation-preventing annular locking bush 202 which is internally polygonal and is adapted to fit over both regions so as to be locked thereat and prevent the mutual rotation of the two parts.

The bush 202 is in fact provided, in an upward region, with notches 337 which allow the flexing of a corresponding part thereof which is internally provided with an annular protruding edge 338 which is adapted to fit with a snap action in a corresponding annular slot 339 of the stump 203.

Advantageously, the intrabony external part of the implant 201 is formed by two threaded portions 216 and 218 in order to allow easy insertion and grip.

Both threaded portions 216 and 218 end, in an upward region, with respective shoulders 361 and 381, each of which substantially forms a

fishbone wedge so as to improve grip.

Equally advantageously, in the threaded regions there are longitudinal notches, not shown in the figures, so as to provide corresponding cutting edges for the self-tapping of the implant 1 on the bone during screwing.

- 5 In practice it has been observed that the intended aim of the invention has been achieved, a quick coupling of the bayonet type with axial and rotary motion having been achieved which provides the advantage of adequate safety against loosening and breakage in addition to quick action.

- The invention thus conceived is susceptible of numerous modifications  
10 and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials used, as well as the dimensions, may be any according to requirements.

- 15 The disclosures in Italian Patent Application No. UD99A000056 from which this application claims priority are incorporated herein by reference.

CLAIMS

1. An implant for artificial teeth, comprising:

-- an intrabony insert or implant (1) which is designed to be inserted in a fixed manner in the jawbone and is provided with a cavity (10);

5      -- an artificial tooth assembly with a tooth stump (3) for the respective artificial tooth and a stem to be inserted and fixed in said cavity of said intrabony insert or implant;

characterized in that said cavity (10) of said intrabony implant has an undercut annular recess (12) below and above which there are hole portions  
10      (11,13,14) having a smaller diameter, one (11) of said hole portions, above said recess (12), being interrupted by at least one longitudinal access slot (121) for the passage of at least one lug of the stem of said tooth stump (3) by axial sliding and subsequent rotation, the outer upper end of said intrabony implant being polygonal, said tooth stump (3) protruding beyond  
15      said lug with a polygonal region for the insertion of a polygonal annular bush for the mutual locking of said stump (3) with respect to said intrabony implant (1) so as to prevent rotation.

2. The implant according to claim 1, characterized in that the external part of the intrabony implant is threaded.

20      3. The implant according to claim 2, characterized in that said intrabony part is formed by two conical threaded portions which end, in an upward region, with respective shoulders, each of which substantially forms a fishbone wedge.

4. The implant according to claims 2 and 3, characterized in that in said  
25      threaded regions there are longitudinal notches so as to form corresponding cutting edges for the self-tapping of the implant on the bone during screwing.

5. The implant according to one or more of the preceding claims, characterized in that the mating between the lower part of said stump and  
30      the corresponding cavity is provided by virtue of complementarily shaped

conical parts.

6. The implant according to one or more of the preceding claims, characterized in that the lower part of said stump to be inserted in said cavity has an end portion which has a smaller diameter and is covered by a cap-like element made of elastic material, the distance between the upper wall of said undercut recess and the bottom of said cavity being shorter than the distance between the upper part of said lug and the end of the cap-like element, so that the latter is compressed upon mating.

7. The implant according to one or more of the preceding claims, characterized in that said bush is provided, in an upward region, with notches which allow the flexing of a corresponding part thereof which is internally provided with a raised annular edge which is suitable to fit, with a snap action, in a corresponding annular slot of said stump.

1/4

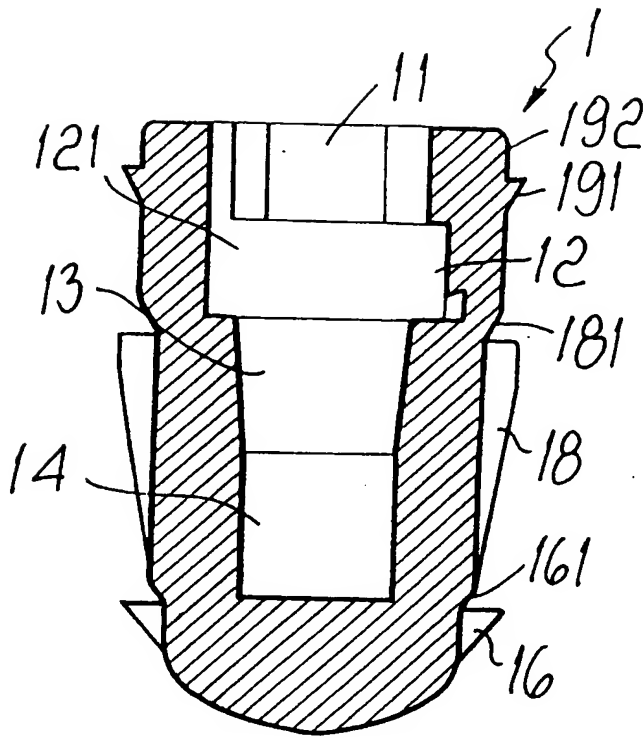


Fig. 1

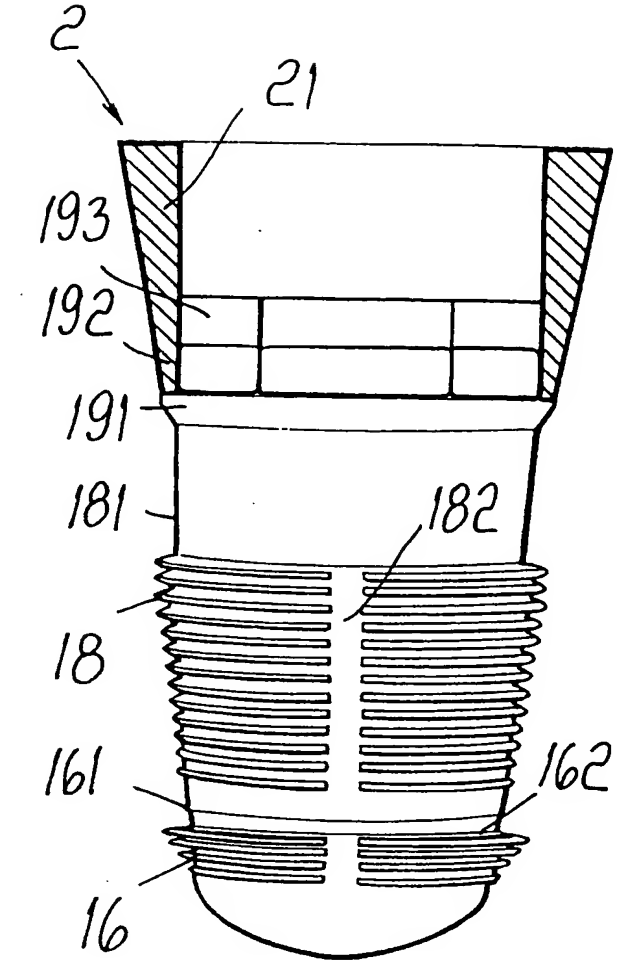


Fig. 3

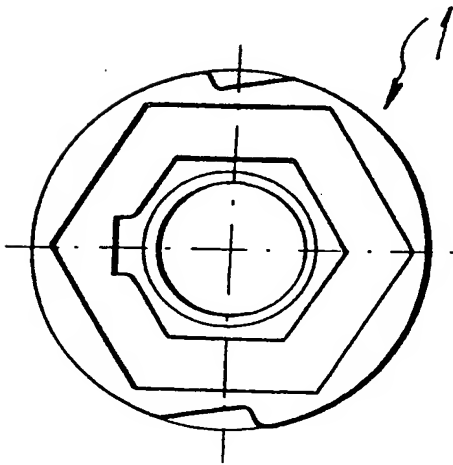


Fig. 2

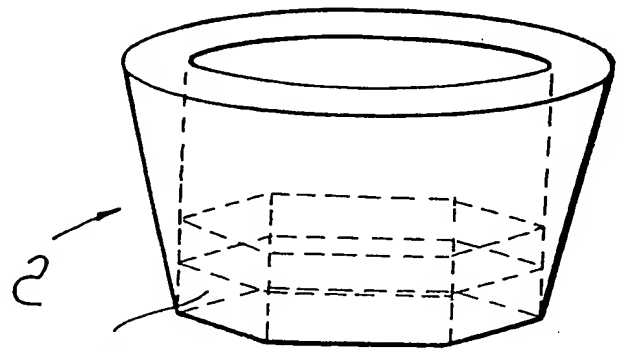


Fig. 4

2/4

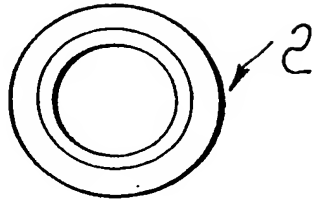


FIG. 5

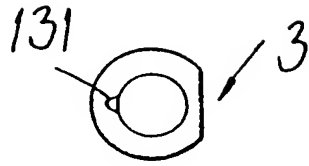


FIG. 7

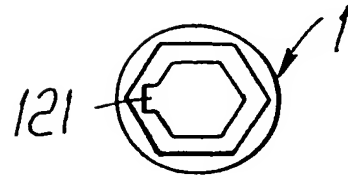


FIG. 9

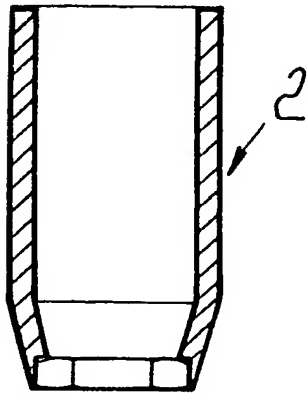


FIG. 6

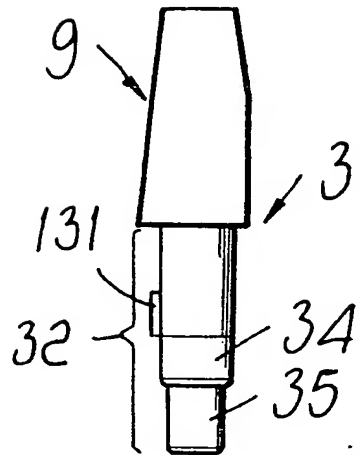


FIG. 8

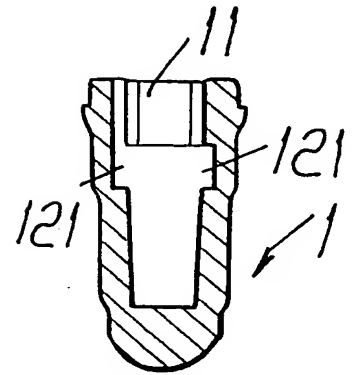


FIG. 10

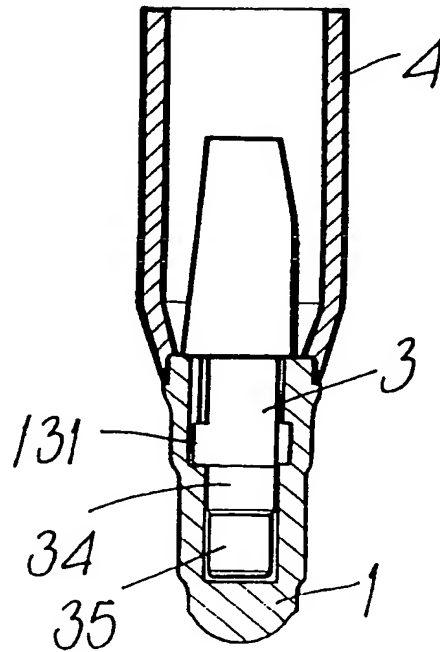


FIG. 11

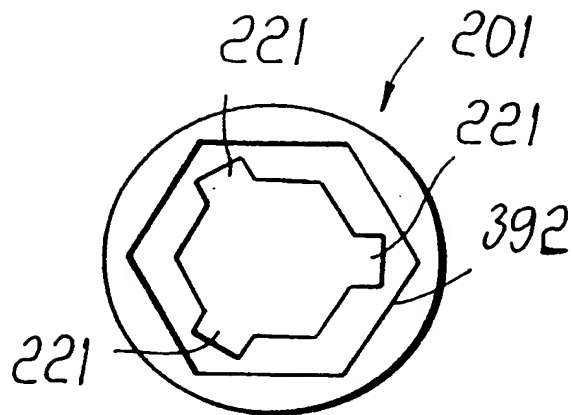


FIG. 12

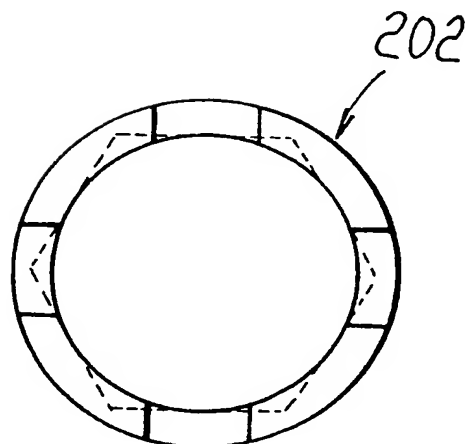


FIG. 14

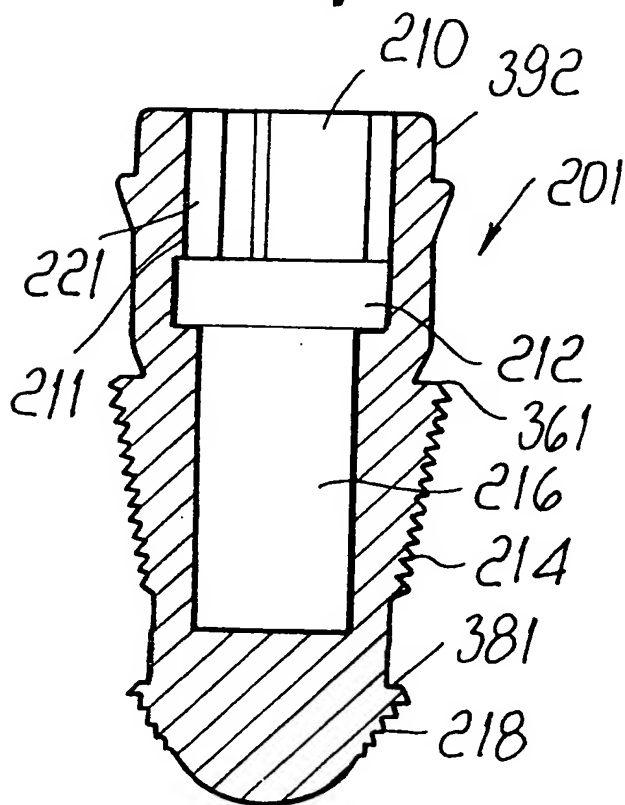


FIG. 13

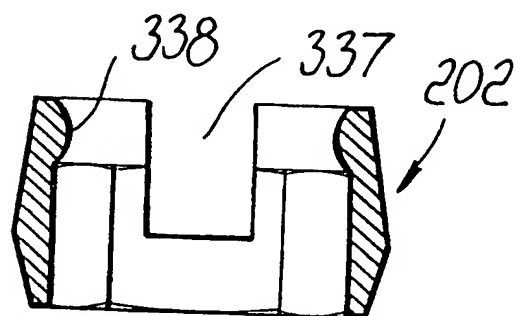


FIG. 15

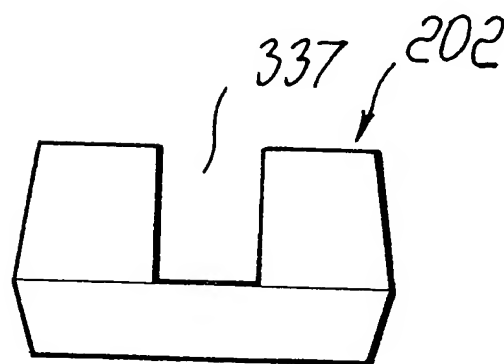


FIG. 16

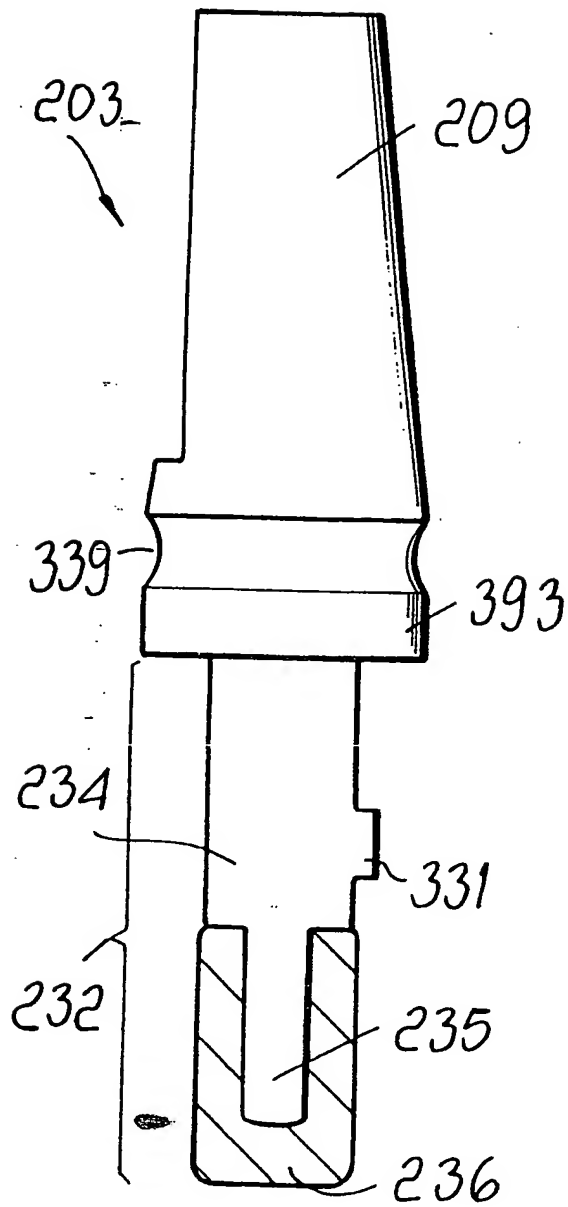


Fig. 17

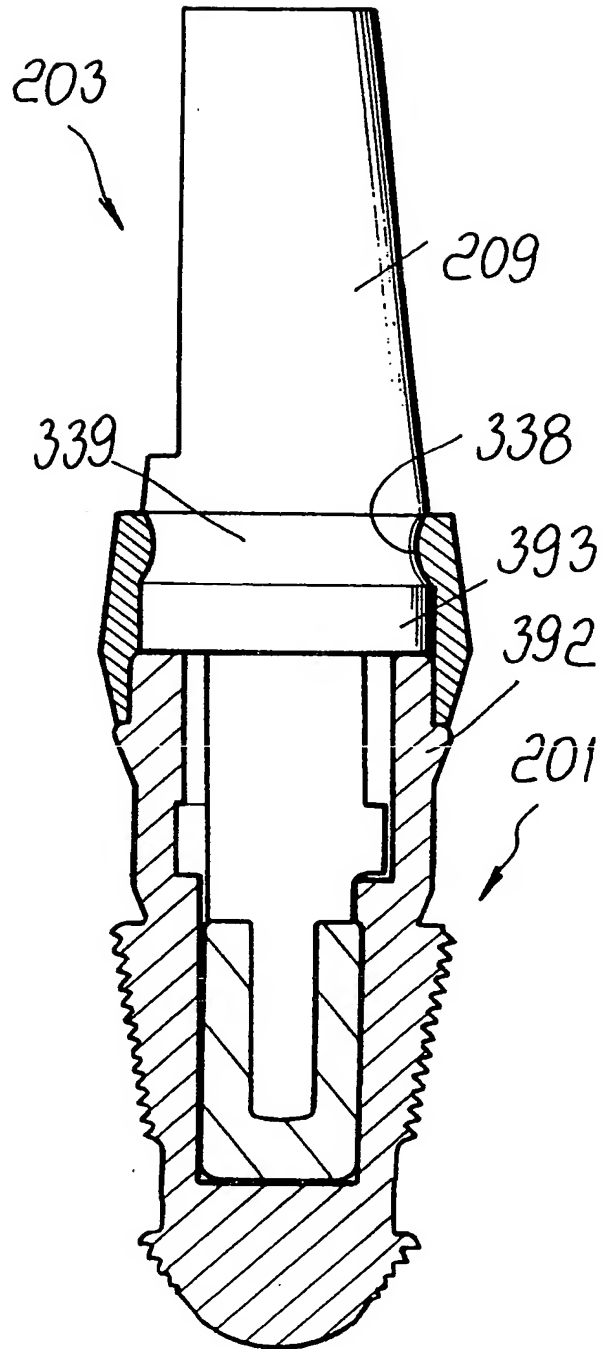


Fig. 18



PCT/EP 00/00630

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 00/00630

**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 19950 A (MENA RAUL R) 4 July 1996 (1996-07-04) page 4, line 13 -page 5, line 13 page 6, line 8 -page 7, line 4 figures 1,6,7	1,2,4,5
A	EP 0 424 734 A (VRESPA GIUSEPPE) 2 May 1991 (1991-05-02) column 16, line 56 -column 17, line 48; figures 1-3	2-4
A	US 3 466 748 A (CHRISTENSEN ROBERT W) 16 September 1969 (1969-09-16) column 2, line 66 -column 3, line 20; figure 1	3
A	US 4 957 437 A (SHIMURA KAIZO ET AL) 18 September 1990 (1990-09-18) column 2, line 27 - line 38 column 4, line 46 -column 5, line 27 figure 1	6,7
A	DE 40 41 378 A (MOISIADIS STAVROS DR) 25 June 1992 (1992-06-25) column 2, line 65 -column 3, line 11; figure 1	6

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/00630

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5092771	A	03-03-1992	AT 157854 T	15-09-1997
			AU 9059091 A	25-06-1992
			DE 69127637 D	16-10-1997
			DE 69127637 T	09-04-1998
			EP 0572414 A	08-12-1993
			ES 2110484 T	16-02-1998
			WO 9209242 A	11-06-1992
DE 19635619	A	05-03-1998	AU 4294597 A	26-03-1998
			WO 9809581 A	12-03-1998
WO 9637161	A	28-11-1996	US 5725375 A	10-03-1998
			AU 5801396 A	11-12-1996
			BR 9609291 A	11-05-1999
			EP 0837658 A	29-04-1998
			JP 11505749 T	25-05-1999
			NO 975401 A	25-11-1997
			US 5989026 A	23-11-1999
			US 5829977 A	03-11-1998
			US 5984680 A	16-11-1999
			ZA 9604192 A	20-08-1996
WO 9619950	A	04-07-1996	AU 706046 B	10-06-1999
			AU 1596295 A	19-07-1996
			BR 9408642 A	07-12-1999
			EP 0841878 A	20-05-1998
			JP 10511291 T	04-11-1998
EP 0424734	A	02-05-1991	IT 1237496 B	08-06-1993
			AT 119011 T	15-03-1995
			AT 146061 T	15-12-1996
			CA 2028597 A	27-04-1991
			DE 69017349 D	06-04-1995
			DE 69017349 T	29-06-1995
			DE 69029404 D	23-01-1997
			DE 69029404 T	07-05-1997
			DK 424734 T	22-05-1995
			EP 0557899 A	01-09-1993
			EP 0554915 A	11-08-1993
			ES 2070236 T	01-06-1995
			US 5593410 A	14-01-1997
			US 5259398 A	09-11-1993
US 3466748	A	16-09-1969	NONE	
US 4957437	A	18-09-1990	JP 1214360 A	28-08-1989
			JP 2580677 B	12-02-1997
			DE 3905608 A	07-09-1989
			FR 2627378 A	25-08-1989
			GB 2216013 A,B	04-10-1989
			NL 8900452 A,B,	18-09-1989
DE 4041378	A	25-06-1992	NONE	